



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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Seattle, Washington 98101

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Environmental Cleanup Office

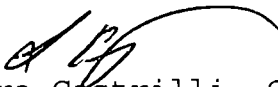
IN REPLY

REFER TO: OEA-095

June 17, 1999

MEMORANDUM

SUBJECT: Bunker Hill, CLP Metals Analysis, Data Validation
Case: 26932
SDG: MJAH74

FROM:  Laura Castrilli, Chemist
Quality Assurance and Data Unit, OEA

TO: Mary Kay Voytilla, Regional Project Manager
Office of Environmental Cleanup

CC: Bruce Woods, Region 10 CLP TPO
Jim Stefanoff, CH2M Hill

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The following is a validation of ICP-AES and mercury analyses of ten total and ten dissolved water samples from the Bunker Hill project. The analyses were performed following the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis Multi-media, Multi-Concentration, ILM04.0. Analyses were conducted by Southwest Laboratories of Oklahoma, of Broken Arrow, Oklahoma. This validation was conducted for the following samples:

MJAH74	MJAH77	MJAH80	MJAH83	MJAH87	MJAH90	MJAH93
MJAH75	MJAH78	MJAH81	MJAH85	MJAH88	MJAH91	MJAH94
MJAH76	MJAH79	MJAH82	MJAH86	MJAH89	MJAH92	

Data Qualifications

The following comments refer to the Southwest Laboratory's performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM04.0*. The comments presented herein are based on the information provided for the review.

1.0 Timeliness - Acceptable

The technical (40 CFR part 136) holding time from the date of collection for mercury in water is 28 days. The holding time for the remaining metals in water is 180 days. The samples were collected on 04/14/99. Mercury analyses were completed on 04/22/99. ICP-AES analyses were completed on 05/19/99.

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2.0 Sample Preparation - Acceptable

The samples were prepared for mercury and ICP-AES analyses on 04/22/99.

3.0 Calibrations/Calibration Verifications - Acceptable

The samples were analyzed for mercury by CVAAS on 04/22/99. Initial calibration included one blank and five standards. The curve was linear with a correlation coefficient greater than 0.995.

The samples were analyzed by ICP-AES on 05/06/99 (main analyses minus zinc), 05/12/99 (zinc dilutions), 05/17/99 (main dilutions), and 04/18/99 (zinc dilutions). The instruments were standardized according to the analytical method each day of analysis using one blank and a single calibration standard for each element.

All ICP-AES and CVAAS (mercury) calibrations were performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

Continuing calibration verifications (CCVs) are required before and after sample analysis and after every 10 samples during analysis. Mercury recoveries must be within 80-120%. Other metal recoveries must be within 90-110%. The frequency of analysis of CCVs was met. All ICP-AES and CVAAS (mercury) CCVs (initial and continuing) bracketing reported sample results met the recovery criteria; therefore, no qualification was made on this basis.

4.0 Laboratory Control Samples - Acceptable

Laboratory Control samples are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. All recoveries associated with reported sample results met the acceptance criteria.

5.0 Blanks -

Procedural blanks were prepared with the samples to show potential contamination from the digestion or analytical procedure. If an analyte was found in the associated blank, the sample results were qualified if the analyte concentration was less than five times the analytical value in the blank.

Potassium, sodium, and zinc were detected in the preparation blank. Antimony, magnesium, manganese, and zinc were detected in one or more ICP-AES continuing calibration blanks (CCBs). Aluminum, arsenic, and iron had negative values with absolute values greater than the detection limit in one or more CCBs. Based on negative blank contamination, aluminum in samples MJA83 and MJA84 was qualified 'J'.

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All other sample results were greater than five times the associated blank levels (or were already undetected) and were not qualified based on blank contamination.

6.0 ICP-AES Interference Check Sample -

The interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning and end of each sample analysis run and recoveries must be between 80% and 120%. All ICS recoveries associated with reported sample results were within the recovery criterion.

The raw data for a number of samples had interfering levels of iron. Analytes for which iron is an interferent were qualified as follows:

- ◆ Selenium in samples MJA74, MJA75, MJA76, MJA79, MJA81, MJA82, MJA85, MJA86, MJA87, and MJA92 was qualified 'UJ', estimated detection limit (possible false negatives due to high iron) or 'J', estimated (possible low bias due to high iron). Selenium in two of the three ICS-A analyses bracketing these samples had negative results with absolute values greater than the detection limit.
- ◆ Vanadium in samples MJA74, MJA76, MJA82, MJA86, MJA87, and MJA93 was qualified 'UJ', estimated detection limit (possible false positives due to high iron). Vanadium in sample MJA75 was qualified 'J', estimated (possible high bias due to high iron). Vanadium in two of the three ICS-A analyses bracketing these samples had results greater than the detection limit.

Some of the samples required one or more dilution runs to report cadmium, iron, manganese, and/or zinc results within the instrumental linear range. The raw data for all analytes were compared using the available dilutions to see if 1) cadmium, zinc, iron, and/or manganese levels in the undiluted samples were high enough that interelement corrections may not be sufficient for the analytes that were reported from the undiluted analyses or 2) a pattern of suppression or enhancement was evident.

From this comparative study, the following results were qualified due to suspected interference (analytes already qualified due to interference or due to poor serial dilution results were not qualified again, see section 11 for qualification due to serial dilution):

- ◆ Aluminum, arsenic, calcium, cobalt, and nickel were qualified 'J', estimated (pattern of suppression/possible low bias) in sample MJA75.
- ◆ Calcium was qualified 'J', estimated (pattern of suppression/possible low bias) in sample MJA82.
- ◆ Aluminum, arsenic, barium, calcium, cobalt, copper, and nickel were qualified 'J', estimated (pattern of suppression/possible low bias) in sample MJA86.

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7.0 Duplicate Analysis -

Duplicate analyses were done on sample MJA79. Water duplicate results were within the $\pm 20\%$ Relative Percent Difference (RPD) or \pm CRDL criteria for water results < 5 times the CRDL criteria; with the exception of mercury which was outside the \pm CRDL criteria. All mercury results were qualified 'J', estimated based on duplicate precision.

8.0 Field Duplicate Analysis - Not Applicable

Field duplicate analysis for samples in this SDG was not indicated in the field collection documentation.

9.0 Matrix Spike Analysis -

Matrix spike sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. Matrix spike recovery must be within the limits of 75 - 125%.

Matrix spike analyses were done on sample MJA79. All matrix spike recoveries were within the required QC limits, with the exception of mercury (71%), selenium (73.8%), and thallium (32.6%). All mercury, selenium, and thallium results were qualified 'J', estimated (possible low bias except for mercury which has an unknown bias as it was also qualified based on duplicate precision).

10.0 Graphite Furnace Atomic Absorption Spec (GFAAS) QC - Not Applicable -

GFAAS was not used for the analysis of these samples.

11.0 ICP-AES Serial Dilution -

Sample MJA79 was analyzed by ICP-AES serial dilution to check for potential interferences. All analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within the 10%D criteria; with the exception of antimony (25%) and manganese (15%). All antimony and manganese results were qualified 'J', estimated based on serial dilution results.

12.0 Detection Limits - Acceptable

Sample results which fall below the instrument detection limit (IDL) are assigned the value of the instrument detection limit and the 'U' qualifier is attached. Contract Required Detection Limit (CRDL) standards are required to demonstrate a linear calibration curve near the CRDL. CRDL standards were run at the required frequency. Note that some results had to be reported as not detected at levels above the CRDL. This was unavoidable as manganese in a couple of samples saturated (which affects the quantitation of some elements), requiring the lab to analyze and report some results from a dilution analysis.

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13.0 Overall Assessment of the Data

This validation of the data is based on the criteria outlined in the *National Functional Guidelines for Inorganic Data Review (02/94)*. Approximately 27% of the data was qualified based on blank contamination, interference, matrix spike recovery, duplicate precision, or poor serial dilution results. The data as qualified is acceptable for all purposes.

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (02/94) qualifiers used when validating/qualifying data from Inorganic analysis.

DATA QUALIFIERS

- U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- J - The associated value is an estimated quantity.
- R - The data are unusable. (Note: Analyte may or may not be present.)
- UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA74

Lab Name: SOUTHWEST LAB OF OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA74

Matrix (soil/water): WATER

Lab Sample ID: 38079.01

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	13500	-		P
7440-36-0	Antimony	745	-	E J	P
7440-38-2	Arsenic	463	-		P
7440-39-3	Barium	22.5	B		P
7440-41-7	Beryllium	4.2	B		P
7440-43-9	Cadmium	812	-		P
7440-70-2	Calcium	42700	-		P
7440-47-3	Chromium	6.1	B		P
7440-48-4	Cobalt	199	-		P
7440-50-8	Copper	781	-		P
7439-89-6	Iron	435000	-		P
7439-92-1	Lead	473	-		P
7439-95-4	Magnesium	91700	-		P
7439-96-5	Manganese	84400	-	E J	P
7439-97-6	Mercury	0.10	U	N J	CV
7440-02-0	Nickel	167	-		P
7440-09-7	Potassium	897	B		P
7782-49-2	Selenium	3.0	U	N J	P
7440-22-4	Silver	3.6	B		P
7440-23-5	Sodium	972	B		P
7440-28-0	Thallium	3.0	U	N J	P
7440-62-2	Vanadium	1.7	B	U J	P
7440-66-6	Zinc	456000	-		P
	Cyanide		-		NR

Color Before: RED

Clarity Before: CLEAR

Texture:

Color After: YELLOW

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA75

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA74

Matrix (soil/water): WATER

Lab Sample ID: 38079.02

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	315000	-	J	P
7440-36-0	Antimony	345	-	BJ	P
7440-38-2	Arsenic	13700	-	J	P
7440-39-3	Barium	154	B	-	P
7440-41-7	Beryllium	60.0	-	-	P
7440-43-9	Cadmium	29000	-	-	P
7440-70-2	Calcium	256000	-	J	P
7440-47-3	Chromium	169	-	-	P
7440-48-4	Cobalt	7810	-	J	P
7440-50-8	Copper	14700	-	-	P
7439-89-6	Iron	13000000	-	-	P
7439-92-1	Lead	202	-	-	P
7439-95-4	Magnesium	1440000	-	-	P
7439-96-5	Manganese	1860000	-	BJ	P
7439-97-6	Mercury	0.12	B	N*J	CV
7440-02-0	Nickel	6870	-	J	P
7440-09-7	Potassium	495	B	-	P
7782-49-2	Selenium	300	U	NJ	P
7440-22-4	Silver	33.9	-	-	P
7440-23-5	Sodium	517	B	-	P
7440-28-0	Thallium	325	B	NJ	P
7440-62-2	Vanadium	70.5	-	J	P
7440-66-6	Zinc	15400000	-	-	P
	Cyanide		-	-	NR

2/20/99

Color Before: ORANGE

Clarity Before: CLEAR

Texture:

Color After: YELLOW

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA76

Lab Name: SOUTHWEST LAB OF OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA74

Matrix (soil/water): WATER

Lab Sample ID: 38079.03

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	93500	-	-	P
7440-36-0	Antimony	5990	-	BJ	P
7440-38-2	Arsenic	3080	-	-	P
7440-39-3	Barium	76.2	B	-	P
7440-41-7	Beryllium	25.0	U	-	P
7440-43-9	Cadmium	5950	-	-	P
7440-70-2	Calcium	91200	-	-	P
7440-47-3	Chromium	25.0	U	-	P
7440-48-4	Cobalt	1370	-	-	P
7440-50-8	Copper	5740	-	-	P
7439-89-6	Iron	3470000	-	-	P
7439-92-1	Lead	2840	-	-	P
7439-95-4	Magnesium	266000	-	-	P
7439-96-5	Manganese	438000	-	BJ	P
7439-97-6	Mercury	0.16	B	N*J	CV
7440-02-0	Nickel	1020	-	-	P
7440-09-7	Potassium	749	B	-	P
7782-49-2	Selenium	75.0	U	NJ	P
7440-22-4	Silver	50.0	U	-	P
7440-23-5	Sodium	771	B	-	P
7440-28-0	Thallium	75.0	U	NJ	P
7440-62-2	Vanadium	8.5	B	UJ	P
7440-66-6	Zinc	3050000	-	-	P
	Cyanide		-	-	NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture: _____

Color After: COLORLESS

Clarity After: CLEAR

Artifacts: _____

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

MJA777

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA774

Matrix (soil/water): WATER

Lab Sample ID: 38079.04

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	824	-		P
7440-36-0	Antimony	5.0	U	EJ	P
7440-38-2	Arsenic	34.9	-		P
7440-39-3	Barium	5.4	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	3460	B		P
7440-47-3	Chromium	1.1	B		P
7440-48-4	Cobalt	8.5	B		P
7440-50-8	Copper	6.0	B		P
7439-89-6	Iron	16800	-		P
7439-92-1	Lead	26.1	-		P
7439-95-4	Magnesium	1600	B		P
7439-96-5	Manganese	1740	-	EJ	P
7439-97-6	Mercury	0.21	-	N*J	CV
7440-02-0	Nickel	6.3	B		P
7440-09-7	Potassium	600	B		P
7782-49-2	Selenium	3.0	U	NJ	P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	664	B		P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	949	-		P
	Cyanide		-		NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture: _____

Color After: COLORLESS

Clarity After: CLEAR

Artifacts: _____

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA78

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA74

Matrix (soil/water): WATER

Lab Sample ID: 38079.05

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	511	-		P
7440-36-0	Antimony	73.6	-	EJ	P
7440-38-2	Arsenic	24.7	-		P
7440-39-3	Barium	15.1	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	12.6	-		P
7440-70-2	Calcium	356000	-		P
7440-47-3	Chromium	51.1	-		P
7440-48-4	Cobalt	256	-		P
7440-50-8	Copper	8.4	B		P
7439-89-6	Iron	139000	-		P
7439-92-1	Lead	724	-		P
7439-95-4	Magnesium	422000	-		P
7439-96-5	Manganese	375000	-	EJ	P
7439-97-6	Mercury	0.10	U	N*J	CV
7440-02-0	Nickel	232	-		P
7440-09-7	Potassium	14000	-		P
7782-49-2	Selenium	57.0	-	NJ	P
7440-22-4	Silver	9.6	B		P
7440-23-5	Sodium	4040	B		P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	42000	-		P
	Cyanide		-		NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture: _____

Color After: COLORLESS

Clarity After: CLEAR

Artifacts: _____

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA79

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA74

Matrix (soil/water): WATER

Lab Sample ID: 38079.06

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4060	-		P
7440-36-0	Antimony	304	-	EJ	P
7440-38-2	Arsenic	132	-		P
7440-39-3	Barium	31.5	B		P
7440-41-7	Beryllium	1.4	B		P
7440-43-9	Cadmium	233	-		P
7440-70-2	Calcium	178000	-		P
7440-47-3	Chromium	19.1	-		P
7440-48-4	Cobalt	173	-		P
7440-50-8	Copper	227	-		P
7439-89-6	Iron	166000	-		P
7439-92-1	Lead	644	-		P
7439-95-4	Magnesium	226000	-		P
7439-96-5	Manganese	191000	-	EJ	P
7439-97-6	Mercury	0.31	-	N*J	CV
7440-02-0	Nickel	157	-		P
7440-09-7	Potassium	6330	-		P
7782-49-2	Selenium	4.3	B	N*J	P
7440-22-4	Silver	6.3	B		P
7440-23-5	Sodium	2280	B		P
7440-28-0	Thallium	3.0	U	N*J	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	137000	-		P
	Cyanide		-		NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA80

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA74

Matrix (soil/water): WATER

Lab Sample ID: 38079.07

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	116	B		P
7440-36-0	Antimony	8.2	B	EJ	P
7440-38-2	Arsenic	4.9	B		P
7440-39-3	Barium	103	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	20.7			P
7440-70-2	Calcium	21200			P
7440-47-3	Chromium	5.0	B		P
7440-48-4	Cobalt	14.5	B		P
7440-50-8	Copper	18.2	B		P
7439-89-6	Iron	5960			P
7439-92-1	Lead	1240			P
7439-95-4	Magnesium	52700			P
7439-96-5	Manganese	14200		EJ	P
7439-97-6	Mercury	0.10	U	N*J	CV
7440-02-0	Nickel	20.5	B		P
7440-09-7	Potassium	1080	B		P
7782-49-2	Selenium	3.0	U	NJ	P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	1260	B		P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	4370			P
	Cyanide				NR

8/26/99

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

MJAH81

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJAH74

Matrix (soil/water): WATER

Lab Sample ID: 38079.08

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6200	-		P
7440-36-0	Antimony	420	-	EJ	P
7440-38-2	Arsenic	94.6	-		P
7440-39-3	Barium	20.0	B		P
7440-41-7	Beryllium	2.0	B		P
7440-43-9	Cadmium	471	-		P
7440-70-2	Calcium	19000	-		P
7440-47-3	Chromium	4.1	B		P
7440-48-4	Cobalt	47.9	B		P
7440-50-8	Copper	159	-		P
7439-89-6	Iron	156000	-		P
7439-92-1	Lead	687	-		P
7439-95-4	Magnesium	39000	-		P
7439-96-5	Manganese	40500	-	EJ	P
7439-97-6	Mercury	0.10	U	N*J	CV
7440-02-0	Nickel	43.1	-		P
7440-09-7	Potassium	681	B		P
7782-49-2	Selenium	3.0	U	NJ	P
7440-22-4	Silver	2.1	B		P
7440-23-5	Sodium	866	B		P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	176000	-		P
	Cyanide		-		NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA82

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA74

Matrix (soil/water): WATER

Lab Sample ID: 38079.09

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	39100			P
7440-36-0	Antimony	877		E J	P
7440-38-2	Arsenic	3350			P
7440-39-3	Barium	32.0	B		P
7440-41-7	Beryllium	8.6			P
7440-43-9	Cadmium	2190			P
7440-70-2	Calcium	101000		J	P
7440-47-3	Chromium	8.8	B		P
7440-48-4	Cobalt	806			P
7440-50-8	Copper	6790			P
7439-89-6	Iron	1350000			P
7439-92-1	Lead	649			P
7439-95-4	Magnesium	135000			P
7439-96-5	Manganese	165000		E J	P
7439-97-6	Mercury	0.10	U	N* J	CV
7440-02-0	Nickel	639			P
7440-09-7	Potassium	723	B		P
7782-49-2	Selenium	3.0	U	N J	P
7440-22-4	Silver	4.6	B		P
7440-23-5	Sodium	841	B		P
7440-28-0	Thallium	3.0	U	N J	P
7440-62-2	Vanadium	3.3	B	U J	P
7440-66-6	Zinc	979000			P
	Cyanide				NR

Color Before: ORANGE

Clarity Before: CLEAR

Texture:

Color After: YELLOW

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJAH83

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJAH74

Matrix (soil/water): WATER

Lab Sample ID: 38079.10

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	117	B	J	P
7440-36-0	Antimony	8.7	B	E J	P
7440-38-2	Arsenic	4.9	B		P
7440-39-3	Barium	104	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	20.7			P
7440-70-2	Calcium	21300			P
7440-47-3	Chromium	5.2	B		P
7440-48-4	Cobalt	15.4	B		P
7440-50-8	Copper	17.9	B		P
7439-89-6	Iron	5700			P
7439-92-1	Lead	1230			P
7439-95-4	Magnesium	53400			P
7439-96-5	Manganese	14400		E J	P
7439-97-6	Mercury	0.10	U	N * J	CV
7440-02-0	Nickel	21.3	B		P
7440-09-7	Potassium	1050	B		P
7782-49-2	Selenium	3.0	U	N J	P
7440-22-4	Silver	2.4	B		P
7440-23-5	Sodium	1210	B		P
7440-28-0	Thallium	3.0	U	N J	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	4850			P
	Cyanide				NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA85

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA874

Matrix (soil/water): WATER Lab Sample ID: 38079.11

Level (low/med): LOW Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	12900	-		P
7440-36-0	Antimony	731	-	EJ	P
7440-38-2	Arsenic	410	-		P
7440-39-3	Barium	20.1	B		P
7440-41-7	Beryllium	4.2	B		P
7440-43-9	Cadmium	774	-		P
7440-70-2	Calcium	41100	-		P
7440-47-3	Chromium	5.7	B		P
7440-48-4	Cobalt	194	-		P
7440-50-8	Copper	743	-		P
7439-89-6	Iron	410000	-		P
7439-92-1	Lead	452	-		P
7439-95-4	Magnesium	89400	-		P
7439-96-5	Manganese	16100	-	EJ	P
7439-97-6	Mercury	0.10	U	NJ	CV
7440-02-0	Nickel	161	-		P
7440-09-7	Potassium	824	B		P
7782-49-2	Selenium	3.0	U	NJ	P
7440-22-4	Silver	3.6	B		P
7440-23-5	Sodium	902	B		P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	437000	-		P
	Cyanide		-		NR

Color Before: COLORLESS Clarity Before: CLEAR Texture: 4/20/99

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA86

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA874

Matrix (soil/water): WATER

Lab Sample ID: 38079.12

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	302000	-	J	P
7440-36-0	Antimony	318	-	J	P
7440-38-2	Arsenic	13300	-	J	P
7440-39-3	Barium	126	B	J	P
7440-41-7	Beryllium	59.3	-	-	P
7440-43-9	Cadmium	26000	-	-	P
7440-70-2	Calcium	252000	-	J	P
7440-47-3	Chromium	173	-	-	P
7440-48-4	Cobalt	4140	-	J	P
7440-50-8	Copper	13900	-	J	P
7439-89-6	Iron	12900000	-	-	P
7439-92-1	Lead	177	-	-	P
7439-95-4	Magnesium	1370000	-	-	P
7439-96-5	Manganese	2030000	-	J	P
7439-97-6	Mercury	0.11	B	N*J	CV
7440-02-0	Nickel	3460	-	J	P
7440-09-7	Potassium	474	B	-	P
7782-49-2	Selenium	237	-	NJ	P
7440-22-4	Silver	38.3	-	-	P
7440-23-5	Sodium	936	B	-	P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	43.5	B	WJ	P
7440-66-6	Zinc	3760000	-	-	P
	Cyanide		-	-	NR

2004/16/99

Color Before: RED

Clarity Before: CLEAR

Texture:

Color After: YELLOW

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA87

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA874

Matrix (soil/water): WATER Lab Sample ID: 38079.13

Level (low/med): LOW Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	92700			P
7440-36-0	Antimony	697		EJ	P
7440-38-2	Arsenic	2730			P
7440-39-3	Barium	65.8	B		P
7440-41-7	Beryllium	20.8			P
7440-43-9	Cadmium	4490			P
7440-70-2	Calcium	91900			P
7440-47-3	Chromium	45.9			P
7440-48-4	Cobalt	1130			P
7440-50-8	Copper	5520			P
7439-89-6	Iron	3570000			P
7439-92-1	Lead	1090			P
7439-95-4	Magnesium	271000			P
7439-96-5	Manganese	460000		EJ	P
7439-97-6	Mercury	0.10	U	N*J	CV
7440-02-0	Nickel	815			P
7440-09-7	Potassium	683	B		P
7782-49-2	Selenium	60.5		NJ	P
7440-22-4	Silver	12.7			P
7440-23-5	Sodium	876	B		P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	3.5	B	UJ	P
7440-66-6	Zinc	2680000			P
	Cyanide				NR

12/06/1999

Color Before: ORANGE Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJAH88

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJAH74

Matrix (soil/water): WATER

Lab Sample ID: 38079.14

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	754	-		P
7440-36-0	Antimony	5.0	U	EJ	P
7440-38-2	Arsenic	9.3	B		P
7440-39-3	Barium	5.3	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	3440	B		P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	8.5	B		P
7440-50-8	Copper	4.4	B		P
7439-89-6	Iron	14400	-		P
7439-92-1	Lead	22.6	-		P
7439-95-4	Magnesium	1570	B		P
7439-96-5	Manganese	1730		EJ	P
7439-97-6	Mercury	0.10	U	N*J	CV
7440-02-0	Nickel	5.7	B		P
7440-09-7	Potassium	574	B		P
7782-49-2	Selenium	3.0	U	NJ	P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	674	B		P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	2050	-		P
	Cyanide		-		NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJAH89

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJAH74

Matrix (soil/water): WATER

Lab Sample ID: 38079.15

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight)- UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	356	-		P
7440-36-0	Antimony	70.5	-	BJ	P
7440-38-2	Arsenic	21.2	-		P
7440-39-3	Barium	15.2	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	12.9	-		P
7440-70-2	Calcium	362000	-		P
7440-47-3	Chromium	26.1	B		P
7440-48-4	Cobalt	264	-		P
7440-50-8	Copper	4.2	B		P
7439-89-6	Iron	138000	-		P
7439-92-1	Lead	612	-		P
7439-95-4	Magnesium	432000	-		P
7439-96-5	Manganese	398000	-	BJ	P
7439-97-6	Mercury	0.10	U	N*J	CV
7440-02-0	Nickel	235	-		P
7440-09-7	Potassium	15000	-		P
7782-49-2	Selenium	60.0	U	NJ	P
7440-22-4	Silver	13.1	-		P
7440-23-5	Sodium	4200	B		P
7440-28-0	Thallium	60.0	U	NJ	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	41100	-		P
	Cyanide		-		NR

APR 16 1999

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: COLORLESS Clarity After: CLEAR Artifacts: _____

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

MJAH90

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJAH74

Matrix (soil/water): WATER

Lab Sample ID: 38079.16

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3910	-	-	P
7440-36-0	Antimony	296	-	EJ	P
7440-38-2	Arsenic	21.0	-	-	P
7440-39-3	Barium	31.3	B	-	P
7440-41-7	Beryllium	1.7	B	-	P
7440-43-9	Cadmium	231	-	-	P
7440-70-2	Calcium	179000	-	-	P
7440-47-3	Chromium	20.0	U	-	P
7440-48-4	Cobalt	176	-	-	P
7440-50-8	Copper	220	-	-	P
7439-89-6	Iron	101000	-	-	P
7439-92-1	Lead	614	-	-	P
7439-95-4	Magnesium	229000	-	-	P
7439-96-5	Manganese	199000	-	EJ	P
7439-97-6	Mercury	0.10	U	N*J	CV
7440-02-0	Nickel	158	-	-	P
7440-09-7	Potassium	6540	-	-	P
7782-49-2	Selenium	60.0	U	NJ	P
7440-22-4	Silver	6.9	B	-	P
7440-23-5	Sodium	2510	B	-	P
7440-28-0	Thallium	60.0	U	NJ	P
7440-62-2	Vanadium	1.0	U	-	P
7440-66-6	Zinc	131000	-	-	P
	Cyanide		-	-	NR

dec 06/16/99

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA91

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA9174

Matrix (soil/water): WATER

Lab Sample ID: 38079.17

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	9.0	U		P
7440-36-0	Antimony	5.7	B	BJ	P
7440-38-2	Arsenic	2.0	U		P
7440-39-3	Barium	102	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	19.9			P
7440-70-2	Calcium	20900			P
7440-47-3	Chromium	1.9	B		P
7440-48-4	Cobalt	14.4	B		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	1420			P
7439-92-1	Lead	266			P
7439-95-4	Magnesium	51900			P
7439-96-5	Manganese	14000		BJ	P
7439-97-6	Mercury	0.10	U	N*J	CV
7440-02-0	Nickel	19.7	B		P
7440-09-7	Potassium	1010	B		P
7782-49-2	Selenium	3.0	U	NJ	P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	1260	B		P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	4160			P
	Cyanide				NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture:

Color After: COLORLESS

Clarity After: CLEAR

Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA92

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA974

Matrix (soil/water): WATER

Lab Sample ID: 38079.18

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6170	-		P
7440-36-0	Antimony	426	-	EJ	P
7440-38-2	Arsenic	75.7	-		P
7440-39-3	Barium	20.1	B		P
7440-41-7	Beryllium	2.4	B		P
7440-43-9	Cadmium	470	-		P
7440-70-2	Calcium	19300	-		P
7440-47-3	Chromium	4.2	B		P
7440-48-4	Cobalt	49.4	B		P
7440-50-8	Copper	158	-		P
7439-89-6	Iron	150000	-		P
7439-92-1	Lead	703	-		P
7439-95-4	Magnesium	39800	-		P
7439-96-5	Manganese	40700	-	EJ	P
7439-97-6	Mercury	0.10	U	NJ	CV
7440-02-0	Nickel	44.2	-		P
7440-09-7	Potassium	664	B		P
7782-49-2	Selenium	3.0	U	NJ	P
7440-22-4	Silver	2.2	B		P
7440-23-5	Sodium	895	B		P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	177000	-		P
	Cyanide		-		NR

06/16/99

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA93

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA974

Matrix (soil/water): WATER

Lab Sample ID: 38079.19

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	39000	-		P
7440-36-0	Antimony	874	-	EJ	P
7440-38-2	Arsenic	3370	-		P
7440-39-3	Barium	28.3	B		P
7440-41-7	Beryllium	9.0	-		P
7440-43-9	Cadmium	2180	-		P
7440-70-2	Calcium	102000	-		P
7440-47-3	Chromium	20.0	U		P
7440-48-4	Cobalt	823	-		P
7440-50-8	Copper	6680	-		P
7439-89-6	Iron	1340000	-		P
7439-92-1	Lead	650	-		P
7439-95-4	Magnesium	137000	-		P
7439-96-5	Manganese	166000	-	EJ	P
7439-97-6	Mercury	0.10	U	NJ	CV
7440-02-0	Nickel	649	-		P
7440-09-7	Potassium	719	B		P
7782-49-2	Selenium	60.0	U	NJ	P
7440-22-4	Silver	5.7	B		P
7440-23-5	Sodium	980	B		P
7440-28-0	Thallium	60.0	U	NJ	P
7440-62-2	Vanadium	2.3	B	UJ	P
7440-66-6	Zinc	1150000	-		P
	Cyanide		-		NR

Color Before: YELLOW

Clarity Before: CLEAR

Texture: _____

Color After: YELLOW

Clarity After: CLEAR

Artifacts: _____

Comments:

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJA94

Lab Name: SOUTHWEST LAB OF OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 26932 SAS No.: SDG No.: MJA94

Matrix (soil/water): WATER

Lab Sample ID: 38079.20

Level (low/med): LOW

Date Received: 04/15/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	23.0	B	J	P
7440-36-0	Antimony	5.8	B	EJ	P
7440-38-2	Arsenic	2.0	U		P
7440-39-3	Barium	104	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	20.1			P
7440-70-2	Calcium	21100			P
7440-47-3	Chromium	2.3	B		P
7440-48-4	Cobalt	14.9	B		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	1500			P
7439-92-1	Lead	294			P
7439-95-4	Magnesium	53100			P
7439-96-5	Manganese	14200		EJ	P
7439-97-6	Mercury	0.10	U	N*J	CV
7440-02-0	Nickel	19.6	B		P
7440-09-7	Potassium	1020	B		P
7782-49-2	Selenium	3.0	U	NJ	P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	1270	B		P
7440-28-0	Thallium	3.0	U	NJ	P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	4420			P
	Cyanide				NR

Color Before: COLORLESS

Clarity Before: CLEAR

Texture: _____

Color After: COLORLESS

Clarity After: CLEAR

Artifacts: _____

Comments: